



Ingenuity Mars Helicopter

MEPAG 2/2/22

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Ingenuity Mars Helicopter

Flight #1 4/19/21

100% Mission Success

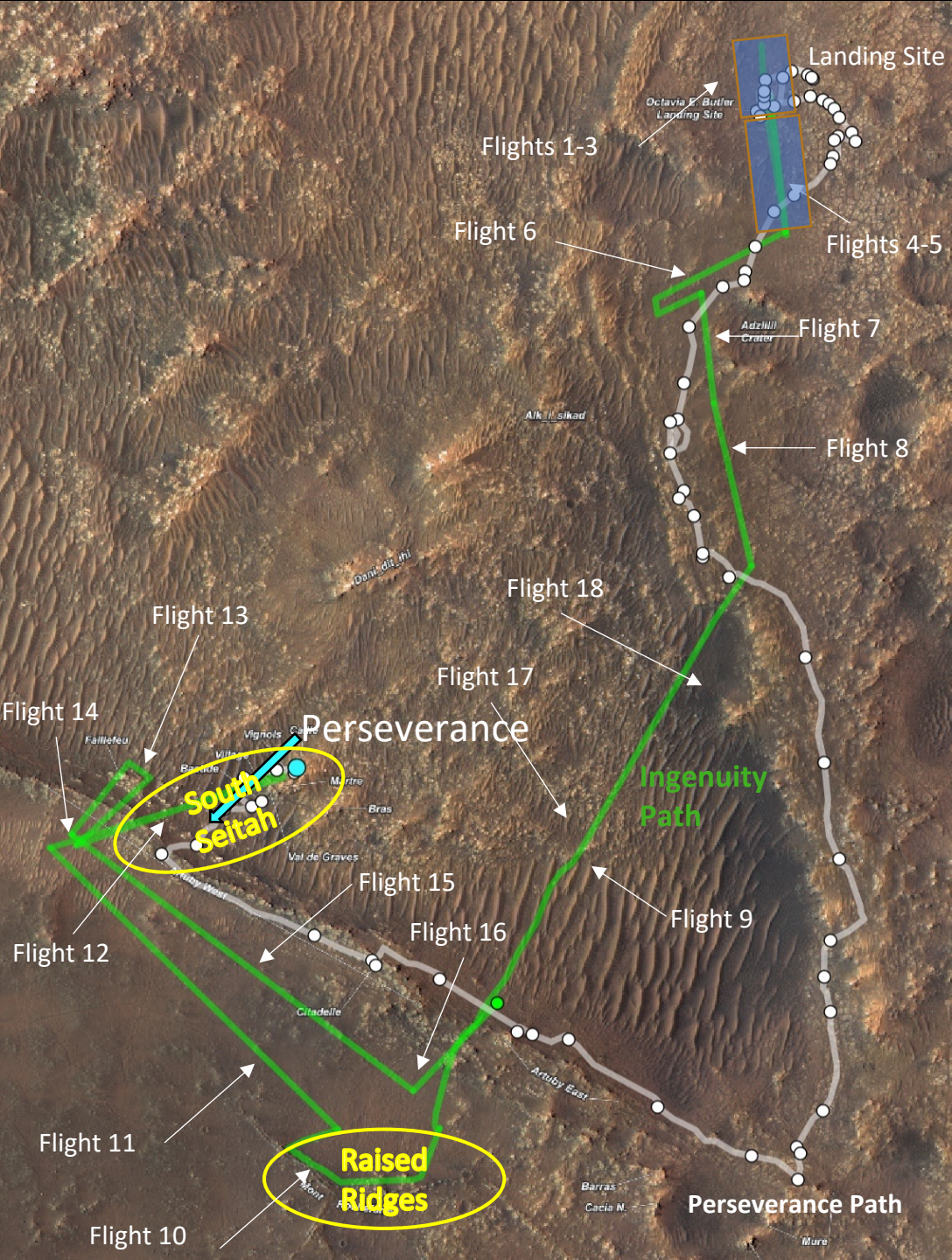
- Technology Demonstration
 - Prime Directive— Martian Wright brothers flight
- Wealth of unique vehicle and sensor data
 - Color(13MP) / B&W(0.5MP) cameras, IMU, laser altimeter, insolation, thermals, flight dynamics
 - Pathfinder for future science applications on Mars
- Tech. Demo Complete!
 - Transitioned to Ops. Demo ~May 8



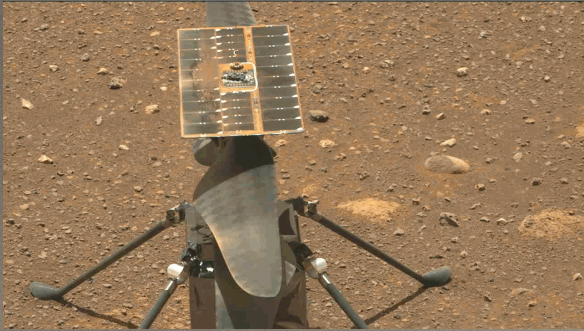
Imagery from Mastcam-Z/
Caltech/JPL/ASU/MSSS

Ingenuity Mars Helicopter

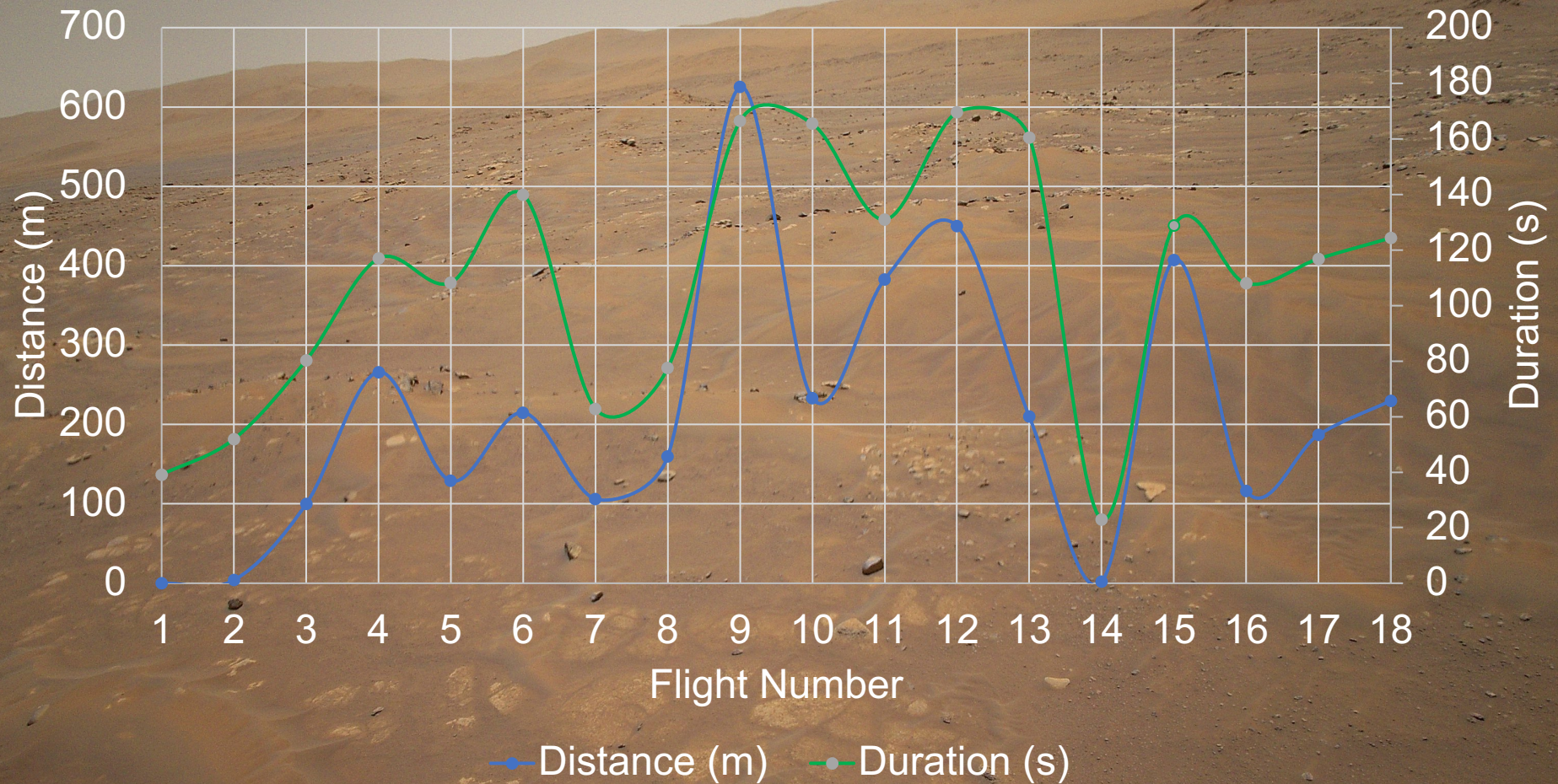
What has Ingenuity been up to since April 2021?



- 18 Flights
 - 3.8km flown over 32m53s
- 2532 Navigation-Camera images downlinked
- 127x High-Res. Color images downlinked
- 289 Sols of COTS survival
- Spring → Summer Seasonal Changes
 - Lower Air Density → Higher RPM (2537→2700)
 - Large Dust Storm (Sols 310-314)
- 2x Flight Software Upgrades
- Science Scouting Missions
- Rover Planner Scouting Missions



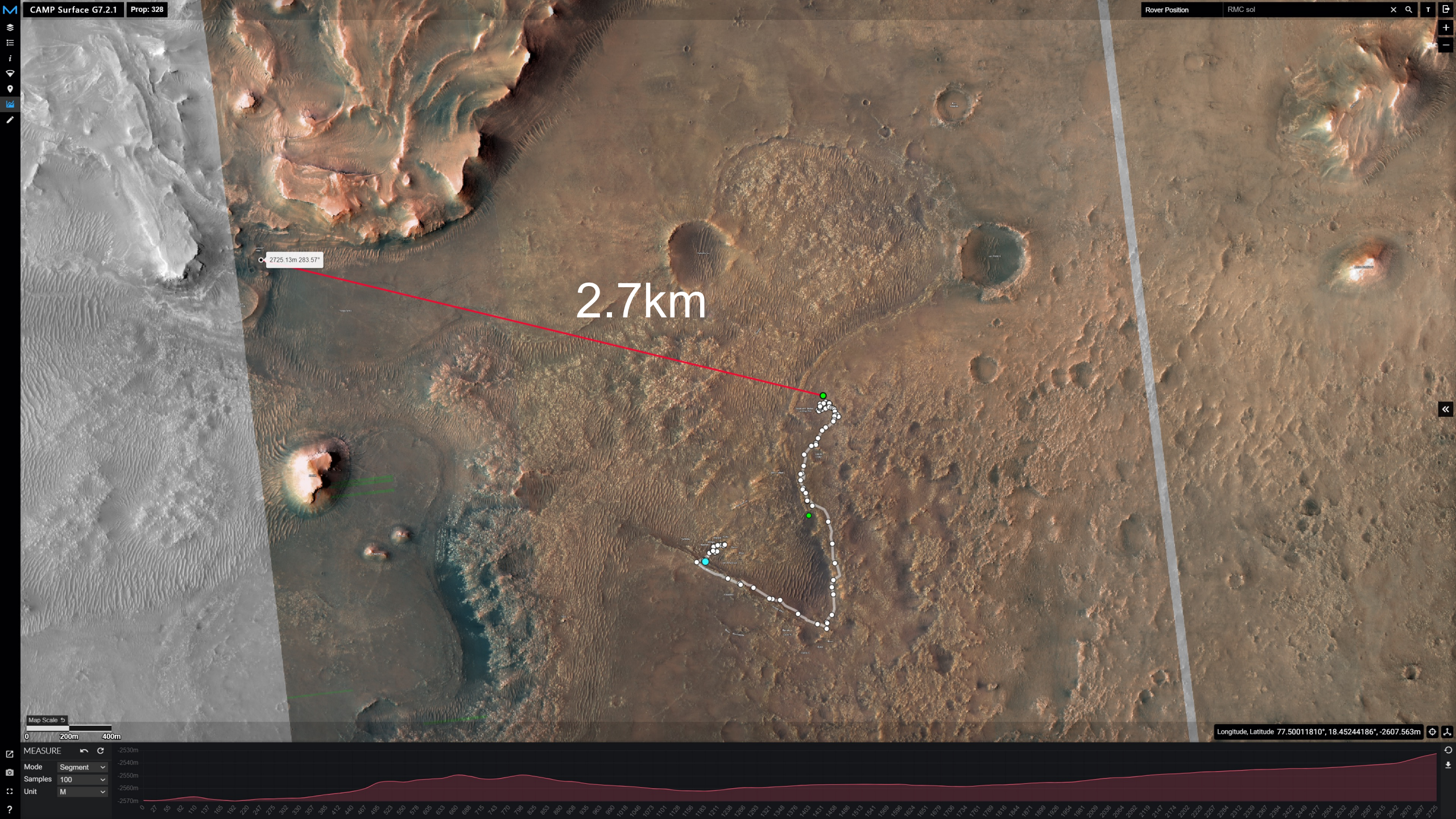
Ingenuity Flight History



Ingenuity Mars Helicopter

What comes next?





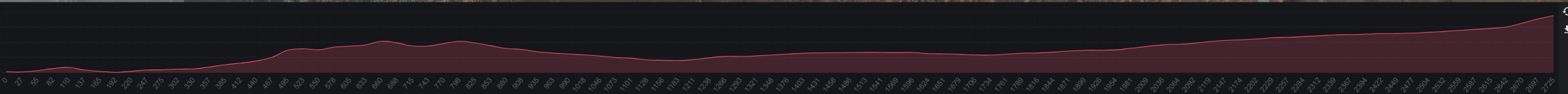
2725 13m 283.57°

2.7km

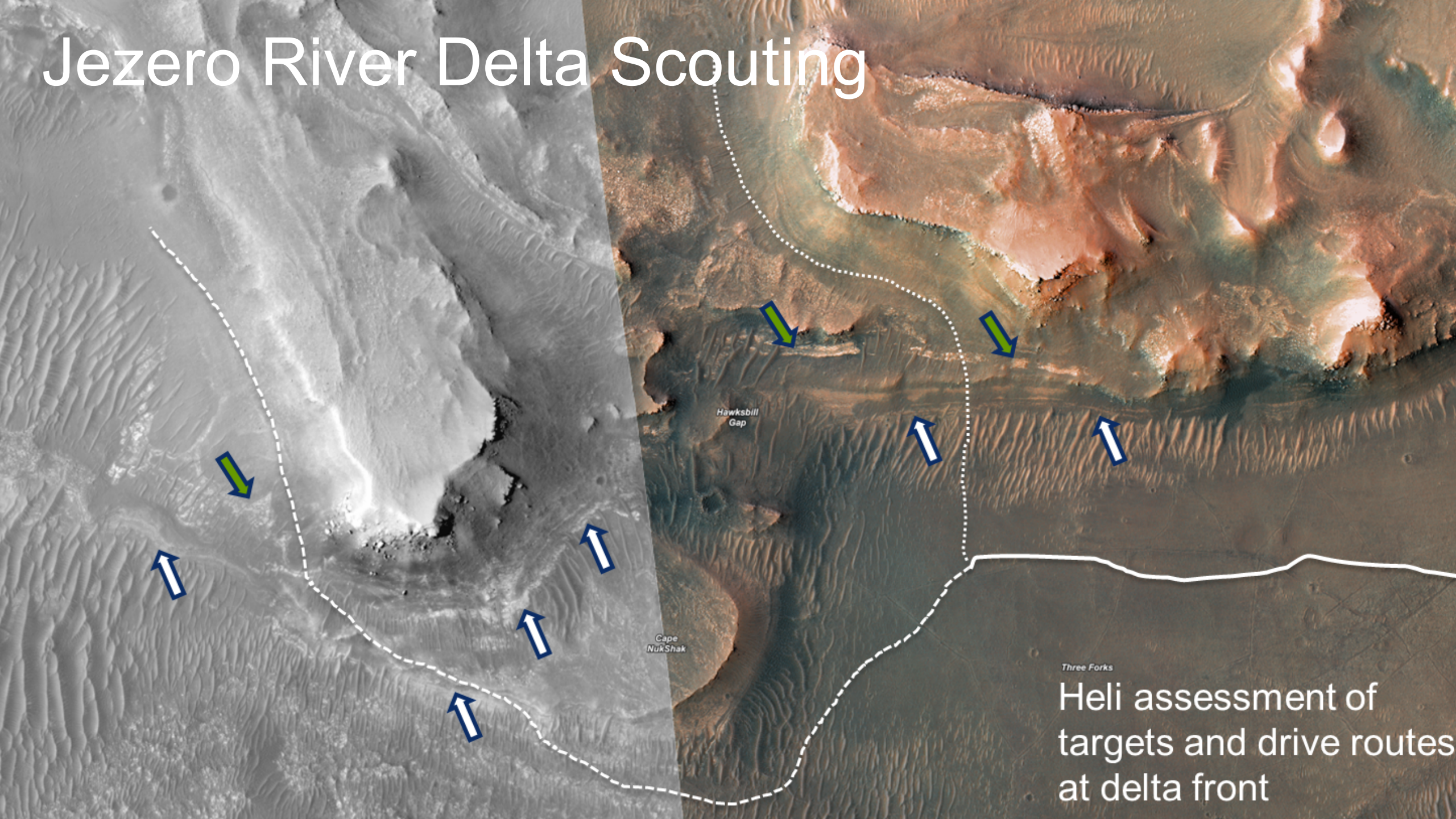
Map Scale 0 200m 400m

MEASURE
Mode Segment
Samples 100
Unit M

Longitude, Latitude 77.50011810°, 18.45244186°, -2607.563m



Jezero River Delta Scouting



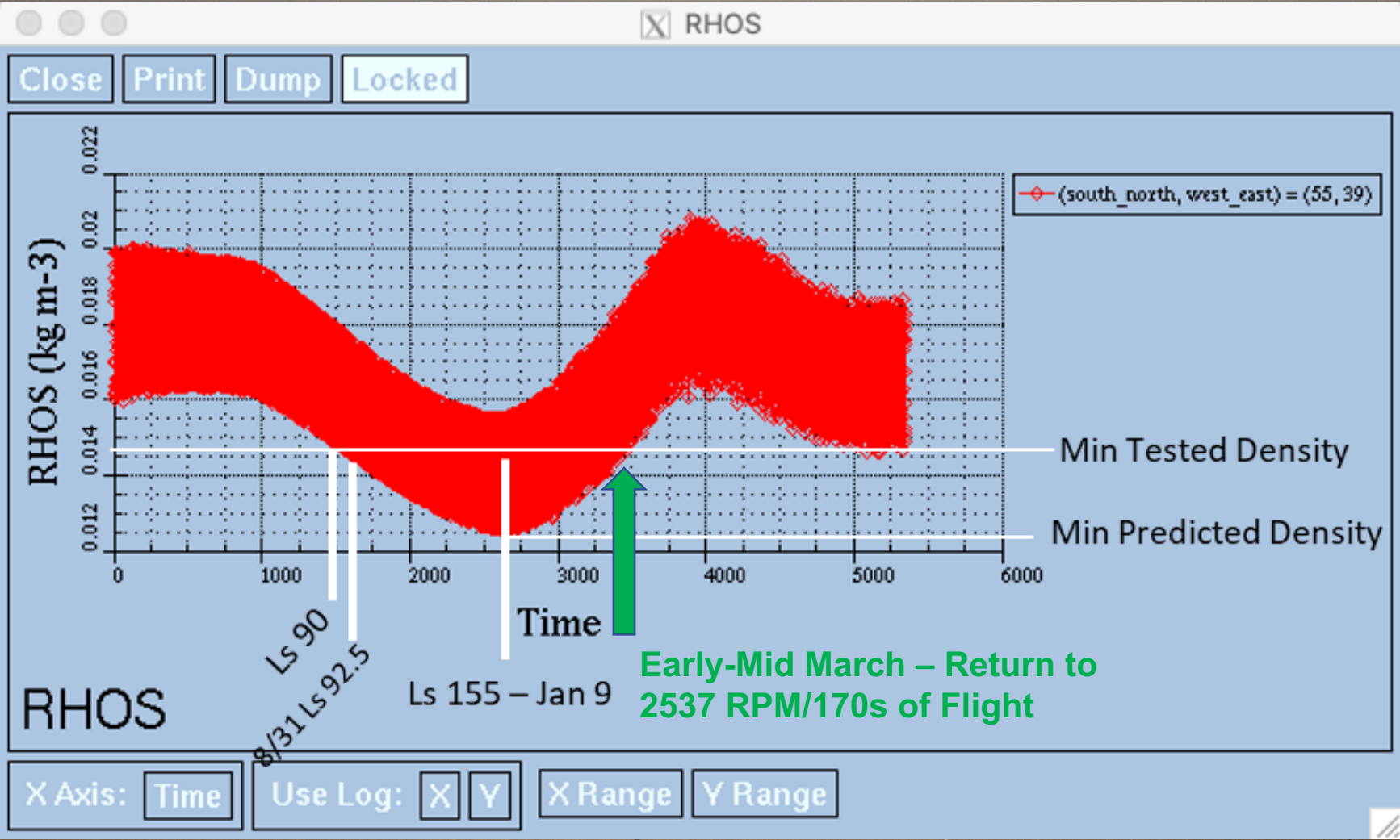
Hawksbill
Gap

Cape
NukShak

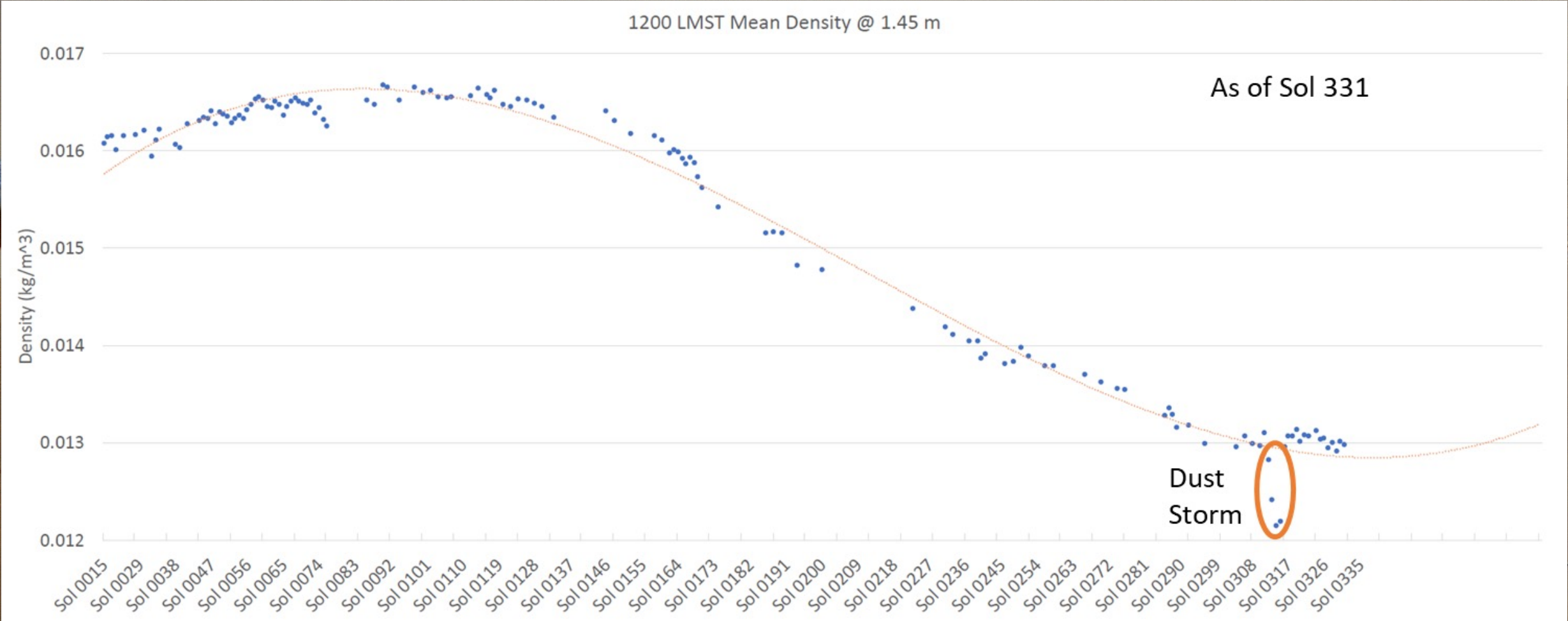
Three Forks

Heli assessment of
targets and drive routes
at delta front

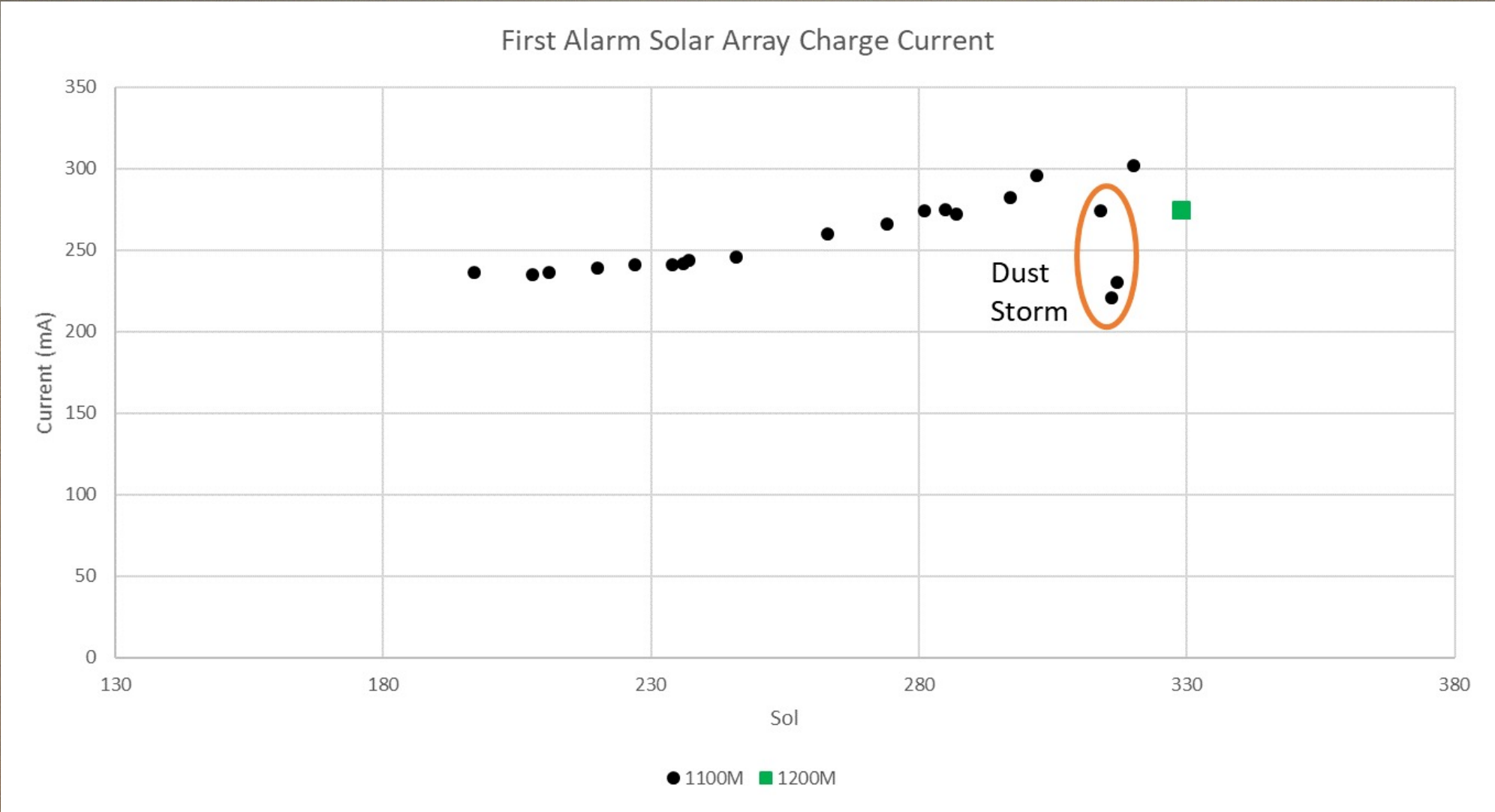
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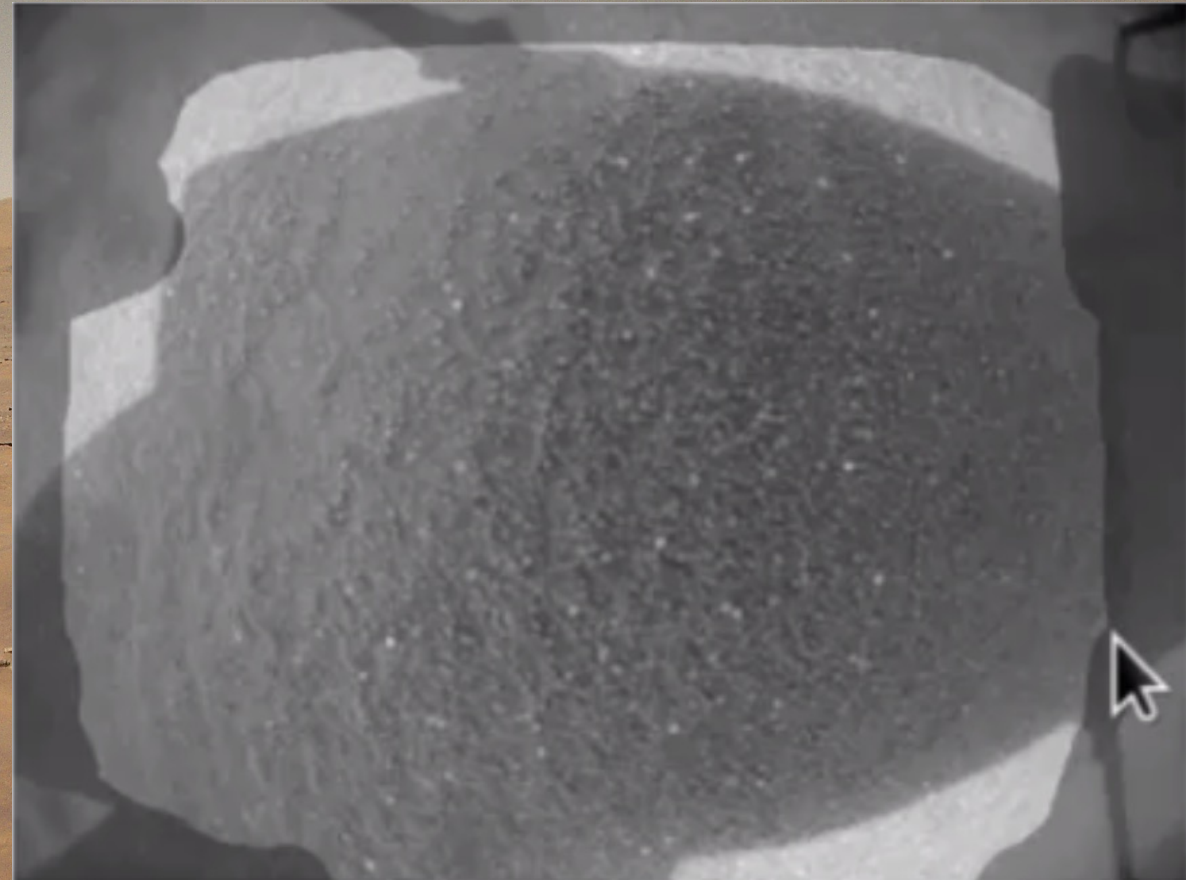
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Sol 317



New Image Mask

Ingenuity – The Technology Today

Accomplishments to Date

- Flight Log
 - 3.8km total flight distance(18 flights)
 - Longest flight to date 625m
 - 32 mins total flight time
- Imaging of science targets with color camera
 - 2.5 mm/pixel - 3cm/pixel in flight
 - 100's of microns resolution when helicopter is landed – enables grain counts
- Creation of orthoimages and digital terrain models using both Navigation(B&W) and Color cameras
- Scouting
- More to come...

Potential Next Flights

- Stretch capabilities :
 - New FSW upgrades, navigation capabilities, imaging capabilities, autonomy
- Operations Demos - Scouting surveys of Jezero River Delta prior to rover driving campaigns
- Data Mining from Collected Data
- High performance computer available for data compression/analysis





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